# EEDING the DAIRY HERD




ircular 677

VERSITY OF ILLINOIS · COLLEGE OF AGRICULTURE
ension Service in Agriculture and Home Economics

*Do you make these*

# COMMON MISTAKES *in* WINTER *Feeding?*

Feed too little green leafy hay?

Let high-producing cows fill up on low-value feeds such as cornstalk pasture or cured corn stover?

Use whole ear corn and other unground grains?

Neglect to feed enough protein supplement with farm-grain mixtures?

Feed grain mixtures without reference to milk yields?

—*Such mistakes cost a dairyman many gallons of milk . . .*

(This circular is a revision of Circular 502 of the same title)

Urbana, Illinois February, 1951

Cooperative Extension Work in Agriculture and Home Economics: University of Illinois, College of Agriculture, and the United States Department of Agriculture cooperating. H. P. RUSK, *Director*. Acts approved by Congress May 8 and June 30, 1914.

# CONTENTS

Legume hay for winter feeding

**Best foundation** for good dairy rations is legume hay in the winter and legume or part-legume pasture during the grazing season.

Also needed if cows are to give large quantities of milk are properly balanced grain mixtures fed in proportion to production.

Legume or part-legume pasture for summer grazing

# FEEDING THE DAIRY HERD

By W. B. NEVENS, Professor of Dairy Cattle Feeding

A MUCH BETTER JOB of feeding dairy cattle can be done on many Illinois farms than is being done. This is shown by the experience of dairymen who have joined the Dairy Herd Improvement Associations and kept precise records of milk and butterfat yields. The principal ways in which improvement can be accomplished are these:

*By using*

- Hay consisting entirely or largely of legumes.
- Green, leafy hay free from mold, mustiness, and weeds.
- All the high-quality hay that high-producing cows will eat.
- Well-balanced grain mixtures.
- Grass-legume pastures kept highly productive with fertilizers and good management.
- Liberal amounts of feed throughout the year.

—and by studying the needs of each animal and adjusting its feeds accordingly.

Good feed and care for the dairy herd nearly always mean greater profits. While it costs more to feed a high-producing cow than a low-producing one, better returns more than offset the added expense. Profits are largest when each cow in the herd produces a large amount of milk each year. This

## High-Producing Cows Are Most Profitable

| Butterfat per cow per year | Feed cost per cow[a] yearly | Feed cost per pound of butterfat | Yearly returns above feed cost |
|---|---|---|---|
| 200 pounds | $132 | $.61 | $ 89 |
| 300 pounds | 156 | .52 | 195 |
| 400 pounds | 177 | .44 | 290 |
| 500 pounds | 203 | .41 | 385 |

[a] Costs based on records of cows enrolled in Dairy Herd Improvement Associations in Illinois in 1948.

goal — high production by every cow in the herd — can b attained and maintained only by *culling out* the low producers *feeding* each animal well, and *breeding* for high production

## QUALITIES OF A GOOD DAIRY RATION

Of all the feeds, young pasture grass comes nearest t meeting all the requirements of a good ration for dairy cows Winter rations should therefore be made up of a mixture o feeds which will have, as a whole, as many of the followin characteristics as possible.

**Appetizing.** Nearly all the usual feeds are appetizing i they are of good quality.

**Varied.** A ration made up of several suitable feeds i more likely to be palatable and have the right kinds an amounts of nutrients than one consisting of only one o two feeds.

**Succulent.** Green, growing pasture, silage, and root crop encourage cows to eat more feed.

**Adequate in protein.** Cows cannot give high yields o milk on low-protein feeds.

**Highly digestible.** Even when finely ground, the coars parts of cornstalks, soybean and Sudan-grass hay, and weed have little nutritive value.

**Not too bulky.** Feeding only roughage (*pasture, hay, silage* limits the nutrient intake. Some concentrated feed (*grai mixture*) in addition is needed for high milk yields.

**Slightly laxative.** Legume hays, linseed meal, wheat bra molasses, and the succulent feeds and grasses have a slightl laxative effect.

**Wholesome.** Moldy, heated, or fermented feeds, or newl made hay and silage often cause cows to go off feed or caus serious illness. Sudden changing of feeds may cause indige tion, diarrhea, and bad flavors in the milk.

**Conducive to good milk flavor.** Do not let milk cows eat corn or legume silage, turnips, cabbage, rape, wild garlic, wild onions, ragweeds, or sweet-clover or rye pasture within 6 to 8 hours before milking. Silage should be fed just after milking.

**Economical.** Since, when prices of feeds change, they are likely to change in relation to each other, always keep in mind *relative* costs.

## SIMPLE CLASSIFICATION OF FEEDS TO AID IN SELECTING A RATION

### Palatable Feeds

| *Roughages* | *Concentrates* | *Concentrates* |
|---|---|---|
| Corn silage | Barley | Oats |
| Legume hay and silage, in good condition | Beet pulp | Linseed meal |
| Roots and tubers | Corn | Molasses |
| Fresh green roughages, including pasture | Corn gluten feed | Soybean meal |
| | Corn gluten meal | Wheat bran |
| | Hominy feed | |

### Laxative Feeds

| *Roughages* | *Concentrates* | *Concentrates* |
|---|---|---|
| Corn silage | Flaxseed meal | Soybeans |
| Legume hay and silage | Linseed meal | Soybean meal |
| Roots and tubers | Molasses | Wheat bran |
| Fresh green roughages | | |

### Constipating Feeds

| *Roughages* | *Concentrates* |
|---|---|
| Corn stover | Screenings |
| Most hays except legumes | Sweet sorghum cane seed |
| Straws from the cereal grains | |

By legume hay and silage we mean hay and silage from alfalfa, the clovers (alsike, Ladino, mammoth, red, sweet, etc.), cowpeas, lespedeza, and soybeans.

## BARN FEEDING

### Roughage Is the Basis

Best results in dairy feeding usually come when the mai emphasis is put on feeding *large amounts* and a *good variet* of the best roughages rather than on feeding large amount of grain. But even so, high-producing cows cannot do thei best on roughage alone — they must have grain in additio They cannot eat enough bulky feed to supply all the nutrient they need for high milk production.

**Feed hay liberally.** Cows in milk should have all th good-quality hay they will eat without undue waste. Th best hay for dairy cows is green, leafy, fine-stemmed legum hay free from mold, mustiness, or weeds. Green leafy ha is higher in vitamin value than is hay of poor quality, an it helps to produce milk of higher nutritive value.

If the hay is coarse, such as first-cutting alfalfa or soy bean hay, it should be fed liberally and the refused portio given to dry cows or yearling heifers to pick over. Choppin or grinding coarse hays to reduce the amounts refused do not greatly increase their feeding value (see page 29).

More hay will be eaten if it is fed three times a day tha if fed only once or twice — and the more good-quality ha the cows eat, the better. An ample supply of water that not too cold also encourages cows to eat large amounts of ha

**Silage is an excellent roughage.** For cows and old heifers good-quality silage makes an excellent feed. Co silage is usually fed at the rate of 2½ to 3 pounds daily f each 100 pounds of animal weight, or 25 to 40 pounds p animal. Grass-legume silage given in addition to hay is f at about the same rate as corn silage. When used as t only roughage, 50 to 75 pounds may be fed daily, or as mu as the cattle will clean up without waste. These amoun are usually divided into two daily feedings.

Silage having a strong odor should be fed only aft milking.

## What Kind of Grain Mixture?

A simple grain mixture consisting of farm grains, with one or two protein supplements as needed, together with salt, will meet the needs of dairy cows when fed with good roughage. The more protein in the roughage and the better its quality, the lower can be the protein content of the grain mixture. When the cows are on excellent, green, growing pasture, the grain mixture may consist of farm grains only. *In general, the more nearly the roughage is all-legume and the higher its quality, the lower the amount of protein needed in the grain mixture.*

For examples of formulas for grain mixtures to be fed with different kinds of roughage, see pages 10 to 13. For a method for calculating the cost of protein in various protein feeds, see page 17.

## How Much Grain Mixture?

When cows are barn-fed, the usual rate for feeding a grain mixture is 1 pound of mixture for each 3 to 4 pounds of milk. When they are on good pasture, the rate is 1 pound of mixture for each 5 to 6 pounds of milk. Best results, however, can be gained by studying each cow's needs and habits carefully and then making proper adjustments in amounts of grain or of roughage. Some cows eat more hay than the average and so need less grain.

In general, the more of the cow's needs which can be supplied by good roughage, the better the ration. The grain mixture should be depended upon only for that part of the ration which cannot be supplied so economically or efficiently by roughage.

## Measure Grain Mixture for Each Cow

A good job of feeding a dairy herd is impossible unless both the milk produced and the grain fed to each cow are carefully weighed. To feed more than is needed is a waste; but to feed a good cow less than she can make good use

| Mixture fed (see pages 10 to 13) and breed of cattle | AMOUNTS TO FEED DAILY: When roughage is fed *liberally* (all that the cows will eat without undue waste) | AMOUNTS TO FEED DAILY: When roughage is fed in *moderate amounts* |
|---|---|---|
| **About 13 percent total protein (Mixtures 3-6)** | | |
| Ayrshire, Holstein, Swiss | 1 lb. grain mixture to *3.5 lb. milk* | 1 lb. grain mixture to *3 lb. milk* |
| Guernsey, Jersey | 1 lb. grain mixture to *3 lb. milk* | 1 lb. grain mixture to *2.5 lb. milk* |
| **From 15 to 17 percent total protein (Mixtures 7-14)** | | |
| Ayrshire, Holstein, Swiss | 1 lb. grain mixture to *4 lb. milk* | 1 lb. grain mixture to *3.5 lb. milk* |
| Guernsey, Jersey | 1 lb. grain mixture to *3.5 lb. milk* | 1 lb. grain mixture to *3 lb. milk* |

If the milk is measured in gallons, its weight may be computed by multiplying the number of gallons by 8.6, the number of pounds per gallon. Weighing is usually more accurate, however, than measuring in gallons.

of is just as unprofitable. Weighing or otherwise carefully measuring the grain for each cow each time she is fed—whether she is in the barn or on pasture—is thus one of the most important of all operations in the management of a dairy herd.

Weigh the milk produced by each cow during one day at least once each week, and feed grain according to the production. (*See guide to feeding grain mixtures on this page and page 14.*) Best way is to make a chart showing the number of pounds or quarts of grain mixture each cow should receive at each feeding, and then consult the chart each time you weigh or measure the grain mixture. The char

should be changed each week or as often as the milk yields of the cows change appreciably. A sample chart, showing a convenient arrangement, is given below.

### Sample Feeding Chart

For week ending_____

| Cow (name or No.) | Pounds of milk produced daily | Pounds of grain mixture | |
|---|---|---|---|
| | | Daily | Each feeding |
| 1..... | 35 | 10 | 5 |
| 2..... | 28 | 8 | 4 |
| 3..... | 39 | 11 | 5.5 |

A smart dairyman always weighs or otherwise measures the grain mixture in accordance with each cow's needs. Profits can be made or lost at this point.

### Provide for Comfort of Herd

The feeds provided are not the whole story in caring for a dairy herd in winter. Comfortable, clean quarters, plenty of bedding, plenty of water not too cold to drink, regular feeding and milking, and kind treatment in general are management practices that go along with a good feeding program.

Cows giving milk should not be turned out of the barn to stand around for several hours on cold windy days. Nor should they be required to drink ice-water. A tank water-heater is a good investment for any dairyman who does not have a water system in the barn. The cows should be watered at least twice a day.

## GRAIN MIXTURES AT FOUR PROTEIN LEVELS

The mixtures shown here are planned on four levels of total protein, to be used according to the kind and quality of roughage being fed. Choose a mixture to supplement the roughage you are feeding.

### About 10 Percent Total Protein

When cattle are on excellent, green, growing pasture, feed a grain mixture having about 10 percent protein. As soon as pasture begins to mature (grass is turning yellow or heads are well developed), change to a higher protein mixture (*see Pasture Feeding, page 14*).

| No. 1 | *lb.* |
|---|---|
| Ground corn | 550 |
| Ground oats | 435 |
| Salt | 15 |
| | 1,000 |

| No. 2 | *lb.* |
|---|---|
| Ground corn | 450 |
| Ground barley | 200 |
| Ground oats | 335 |
| Salt | 15 |
| | 1,000 |

### About 13 Percent Total Protein

If you are feeding hay or silage made entirely from legumes, or if the cows are on good pasture that has no

begun to ripen, feed a grain mixture having about 13 percent total protein. (If grass hay, corn silage, or any other nonlegume roughage is fed as a substantial part of the roughage, the grain mixture should contain more protein than any of the mixtures on this page will provide.)

**No. 3**

| | *lb.* |
|---|---|
| Linseed meal or soybean meal | 100 |
| Ground corn | 585 |
| Ground oats | 300 |
| Salt | 15 |
| | 1,000 |

**No. 4**

| | *lb.* |
|---|---|
| Linseed meal or soybean meal | 100 |
| Wheat bran | 250 |
| Ground corn | 635 |
| Salt | 15 |
| | 1,000 |

**No. 5**

| | *lb.* |
|---|---|
| Linseed meal or soybean meal | 75 |
| Wheat bran | 200 |
| Ground corn | 400 |
| Ground oats | 310 |
| Salt | 15 |
| | 1,000 |

**No. 6**

| | *lb.* |
|---|---|
| Cottonseed meal or soybean meal | 75 |
| Ground corn | 500 |
| Ground oats | 410 |
| Salt | 15 |
| | 1,000 |

**Adjustments in these mixtures.** *Ground barley* or *ground wheat* may be used to replace ground oats or ground corn, pound for pound, in the above 13-percent mixtures and in the others on pages 12 and 13. Ground corn may be either in the form of shelled-corn meal or corn-and-cob meal. The use of *two or more farm grains* in each mixture is recommended.

If soybean hay is fed, ground soybeans are *not* recommended unless the hay is cut before the seed is well developed.

**Don't overestimate quality of your roughage.** Many farmers think the roughage they feed is higher in protein than it really is, and so do not provide enough protein in

**Only grains and seeds free from mold, mustiness, and rodent droppings should be used for feeding milk cows. Grinding to a medium degree of fineness is advised.**

**Grass-legume silage** is higher in protein than corn silage. Less protein is needed in the grain mixture when it is used.

their grain mixture. They frequently say that they are feeding "all-legume" roughage when in reality a third to half of it consists of grasses and weeds. Such hays should be considered only *part* legume, and should be supplemented by grain mixtures containing about 15 percent protein.

### About 15 Percent Total Protein

If you are feeding (1) part legume and part nonlegume hay, or (2) legume hay and corn silage or stover, or (3) if the cows are on a mixed grass-legume pasture where the grasses are beginning to ripen, use one of these grain mixtures:

| No. 7 | *lb.* |
|---|---|
| Linseed meal or soybean meal | 175 |
| Ground corn | 450 |
| Ground oats | 360 |
| Salt | 15 |
| | 1,000 |

| No. 8 | *lb.* |
|---|---|
| Linseed meal or soybean meal | 175 |
| Wheat bran | 225 |
| Ground corn | 585 |
| Salt | 15 |
| | 1,000 |

| No. 9 | lb. |
|---|---|
| Linseed meal or soybean meal | 150 |
| Wheat bran | 300 |
| Ground corn | 300 |
| Ground oats | 235 |
| Salt | 15 |
| | 1,000 |

| No. 10 | lb. |
|---|---|
| Cottonseed meal | 75 |
| Soybean meal | 100 |
| Ground corn | 500 |
| Ground oats | 310 |
| Salt | 15 |
| | 1,000 |

(See page 11 for possible adjustments in these mixtures.)

### About 17 Percent Total Protein

If the roughage you are feeding is not *at least* one-half legumes, or if the cows are on *fully ripened grass pasture,* feed one of these grain mixtures:

| No. 11 | lb. |
|---|---|
| Linseed meal or soybean meal | 250 |
| Ground corn | 400 |
| Ground oats | 325 |
| Salt | 15 |
| Bonemeal (feeding grade) | 10 |
| | 1,000 |

| No. 12 | lb. |
|---|---|
| Linseed meal or soybean meal | 225 |
| Wheat bran | 275 |
| Ground corn | 475 |
| Salt | 15 |
| Bonemeal (feeding grade) | 10 |
| | 1,000 |

| No. 13 | lb. |
|---|---|
| Linseed meal or soybean meal | 225 |
| Wheat bran | 150 |
| Ground oats | 250 |
| Ground corn | 350 |
| Salt | 15 |
| Bonemeal (feeding grade) | 10 |
| | 1,000 |

| No. 14 | lb. |
|---|---|
| Cottonseed meal | 100 |
| Soybean meal | 150 |
| Ground corn | 375 |
| Ground oats | 350 |
| Salt | 15 |
| Bonemeal (feeding grade) | 10 |
| | 1,000 |

**Adjustments.** Defluorinated rock phosphate may replace bonemeal in the above rations. Also, ground barley or ground wheat may replace ground oats or ground corn, pound for pound. See paragraph on page 11 for other comments concerning replacements.

## PASTURE FEEDING

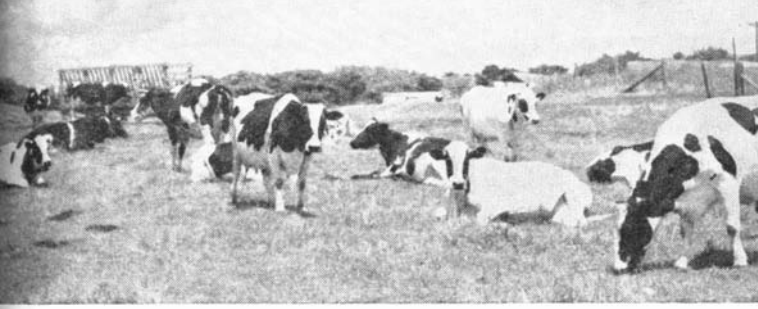
Fresh green pasture grass is the most nearly ideal feed for dairy cows. Only high-producing cows need a grain supplement when they are on good pasture of this sort. But as the season advances and the grass matures, the cows not only eat less of it, but what they do eat contains a smaller proportion of protein. During this time, therefore, more grain should be fed in order to supply the total amount of protein needed.

Rates for feeding grain to cows on pasture are given in the table below.

PASTURE FEEDING: A Guide to Feeding the Grain Mixtures

| Condition of pasture and kind of mixture | AMOUNTS TO FEED DAILY[a] | |
|---|---|---|
| | To Ayrshire, Holstein, and Swiss | To Guernsey and Jersey |
| **Excellent, green growing pasture:** About 10 percent total protein (Mixtures 1 and 2) | 1 lb. grain mixture to *each 3 lb. milk over and above 30 lb.* | 1 lb. grain mixture to *each 2.5 lb. milk over 20 lb.* |
| **Good grass pastures not yet at ripening stage and legume pastures in summer:** About 13 percent total protein (Mixtures 3-6) | 1 lb. grain mixture to *each 3 lb. milk over and above 25 lb.* | 1 lb. grain mixture to *each 2.5 lb. milk over and above 15 lb.* |
| **Grasses beginning to ripen and grass-legume pastures with grasses nearly ripe:** About 15 percent total protein (Mixtures 7-10) | 1 lb. grain mixture to *each 3 lb. milk over and above 20 lb.* | 1 lb. grain mixture to *each 2.5 lb. over and above 12 lb.* |
| **Fully ripened grass pastures:** About 17 percent total protein (Mixtures 11-14) | 1 lb. grain mixture to *each 3 lb. milk over and above 15 lb.* | 1 lb. grain mixture to *each 2.5 lb. milk over and above 10 lb.* |

[a] If the milk is measured in *gallons*, the weight may be computed by multiplying the number of gallons by 8.6, the number of pounds per gallon. Weighing is usually more accurate, however, than measuring in gallons.



When cows are first turned to pasture, some dry roughage in a feed rack helps prevent bloat and a fall in milk yield and fat test. Same rack makes a good place to feed roughage in midsummer when pastures are short.

### Change to Pasture Feeding Gradually

Sudden change from dry feed to pasture may result in bloat or other digestive disturbances and cause bad flavors in the milk. To prevent such conditions, the cattle should be given their usual feed of hay, or other dry roughage or silage, and grain mixture each morning during the first few days they are on pasture. In fact, when pastures are lush and abundant, it is sometimes best to continue to feed dry roughage for the first month or more of the pasture season in order to prevent the lowering of the fat test.

**When pasture consists of legumes.** Cattle must not be turned onto legume pasture, such as red clover, alfalfa, or sweet clover, for the first time when the plants are wet with dew or rain. Under such conditions they are likely to develop bloat. Two further precautions will help to prevent bloat: keep dry straw or hay in or near the pasture where the cattle can get at it, and leave the cattle on the pasture continuously once they have been turned on it.

**Use great care in pasturing Sudan grass.** The young shoots of Sudan grass contain large amounts of deadly prussic

acid, enough to kill cattle within 15 minutes to an hour after they begin grazing on it. The older grass, however, is not only harmless but very valuable for pasture. *Therefore do not pasture Sudan grass until it is at least 18 inches tall.* Also, take the stock off the pasture for three or four days any time new growth starts after a prolonged drouth or a light frost.

When starting to pasture Sudan grass it is always best to turn onto it first a single animal, the least valuable in the herd. If at the end of two hours the grazing animal is all right, the grass is safe for the herd.

With careful handling, Sudan grass at the University farms at Urbana during a period of several years, has caused no poisoning of stock.

### Better Pastures Needed

The pasture season should be the most profitable feeding season, both because pasture plants are the most nearly ideal feed for dairy cows and because the cows harvest the crop themselves. But as a matter of fact, many farmers find the barn feeding season more satisfactory. This is because they use low-yielding pasture crops, and do not manage the pastures and the cows correctly.

To get better yields of better-quality forage, more attention needs to be given to four things: (1) to pasture soils; (2) to a choice of pasture plants; (3) to a succession of pasture crops (both permanent and rotated) throughout the season, and (4) to grazing and management practices.

Grass pastures on untillable land may be greatly improved by seeding into them alfalfa or one or more of the clovers, provided the land is well drained and is properly treated with lime and phosphorus where such treatment is needed. On tillable land legume crops make superior pasture because of their long growing season and their resistance to hot, dry weather.

For further information on pasture crops and pasture

management see *Illinois Circular 553, Supplementing and Improving Dairy Pastures,* and *Circular 647, Pastures for Illinois.*

### Supplement Pasture With Grain Mixture

Growing grass, being high in protein and vitamins, stimulates milk production, but contains so much water that high-producing cows cannot eat enough of it to keep in good flesh. If the cows refuse grain, take them from pasture earlier in the evening, or feed the grain in the morning after they have been on drylot all night.

## HOW TO CALCULATE MIXTURES

Among the mixtures listed on pages 10 to 13 several choices are offered at each level of total protein. Many other suitable formulas could be devised to meet special conditions. Because of changes in prices of feeds from time to time, decided savings can occasionally be made by changing the grain mixture to take advantage of the cheaper feeds. It is therefore usually worth while, before buying feeds or making up formulas for these mixtures, to give special thought to the relative prices of the different items.

### Computing Cost of Total Protein

A good basis for selecting the most economical protein supplement at existing prices is to compare the costs of 100 pounds of total protein in the various feeds available. Amounts of total protein in different feeds are listed on pages 35 and 36.

*Example:* When soybean meal, 42 percent total protein, sells at $3.00 per cwt. and corn gluten feed sells at $2.50, which is the more economical source of protein?

**Price of soybean meal** ..... **$3.00 per cwt.**
Total protein in 100 lb. ..... 42 lb.

$\frac{\$3.00}{42} \times 100 = \$7.14$, the cost of 100 lb. of total protein.

**Price of corn gluten feed** ..... **$2.50 per cwt.**
Total protein in 100 lb. ..... 28 lb.

$\frac{\$2.50}{28} \times 100 = \$8.93$, the cost of 100 lb. of total protein.

Soybean meal at $3.00 per 100 pounds is thus a cheaper source of protein than corn gluten feed at $2.50 per 100 pounds.

## Computing Percentage of Total Protein

Successful feeding of grain mixtures depends in large part on the ability of a feeder to judge the quality of his roughage, and then to make up a grain mixture which will properly supplement *that particular kind and quality of roughage.* The following rules are helpful in determining the percentage of protein needed in the grain mixture:

**1. When the cattle are on excellent, green, growing pasture** which furnishes an abundance of feed, a simple mixture of farm grains having a total protein content of about 10 percent may be used.

**2. When the roughage consists of legume hay or legume silage only** (that is, when no corn silage, corn stover, or pasture is fed), the grain mixture should contain from 12 to 14 percent total protein.

**3. When the roughage consists of legume hay, together with corn silage or stover,** or when mixed hay alone is fed, the grain mixture should contain 14.1 to 16 percent total protein.

**4. When the roughage is all nonlegume,** such as timothy, redtop, millet, Sudan grass, corn silage and stover, the grain mixture should contain from 16.1 to 18 percent total protein.

**5. When the roughage is of excellent quality,** a grain mixture that contains the lower percentage of protein given in each of the above rules (Nos. 2, 3, 4) is used. If the roughage is weathered, has few leaves, or contains a large proportion of weeds, the higher figure should be used.

**6. When the roughage is definitely of high quality and is fed in unusually large amounts,** the grain mixture may safely contain slightly less protein than specified in these rules.

*Example:* Suppose that medium-quality alfalfa hay and medium-quality corn silage, together with ear corn and oats are on hand. With this partly legume and partly nonlegume roughage, a grain mixture containing 14 to 16 percent total

protein is needed; and since the roughage is of *medium* quality, about 15 percent total protein will be right.

In planning the grain mixture to supply the needed amount of protein it is usually best to keep in mind the kinds and amounts of home-grown feed on hand and to calculate a mixture that will, so far as possible, use the feeds in these proportions. Thus if the amount of oats on hand is only two-thirds the amount of corn (*in pounds*), a mixture might be made up to contain 3 parts of corn to 2 parts of oats.

Corn-and-cob meal and oats will not make a mixture containing 15 percent total protein, for corn-and-cob meal contains only 8 percent total protein and oats only 12 percent (*see the table on pages 35 and 36*). Therefore a feed or feeds with a higher percentage of protein must be added to the corn and oats. Suppose soybean meal and wheat bran are added to the mixture in the following proportions:

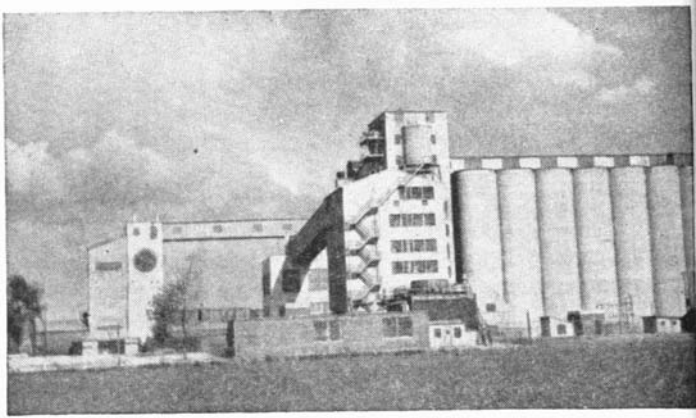
| Kind of feed | Amount of feed | Total protein | |
|---|---|---|---|
| | | In 100 pounds of feed | In amount of feed used in mixture |
| | *lb.* | *lb.* | *lb.* |
| Corn-and-cob meal | 300 | 8 | 24 |
| Ground oats | 200 | 12 | 24 |
| Wheat bran | 200 | 16 | 32 |
| Soybean meal, 42% protein | 50 | 42 | 21 |
| Salt | 12 | 0 | 0 |
| Total | 762 | .. | 101 |

$\frac{101}{762} \times 100 = 13.3$, the percentage of total protein in the mixture.

To raise the protein to about 15 percent, increase the soybean meal to 100 pounds. The mixture will then weigh 812 pounds and contain 122 pounds of total protein.

$\frac{122}{812} \times 100 = 15.0$ percent total protein.

This meets the requirements satisfactorily as a supplement to the medium-quality part-legume roughage.



**High-protein supplements properly used** make for better and cheaper mil production. This processing plant each year turns out millions of pounds o soybean meal, a large part of which is consumed by dairy cattle.

## Computing the Cost of the Mixture

The cost of the mixture per ton can be readily compute according to the prevailing prices of the feeds.

If the prices are: ear corn, 84 cents a bushel; oats, 52 cent a bushel; wheat bran, $48 a ton; soybean meal, $68 a ton; salt $1.50 a hundred pounds; and the cost of grinding 20 cents hundred, the cost of the mixture would be as follows:

| | |
|---|---|
| Ear corn: $.84 ÷ 70 (lb. per bu.) × 300 | $3.60 |
| Oats: $.52 ÷ 32 (lb. per bu.) × 200 | 3.26 |
| Wheat bran: $48 ÷ 2,000 (lb. per ton) × 200 | 4.80 |
| Soybean meal: $68 ÷ 2,000 (lb. per ton) × 100 | 3.40 |
| Salt: $1.50 ÷ 100 × 12 | .18 |
| Grinding: 500 lb. corn and oats at 20 cents per cwt. | 1.00 |
| Total cost for 812 lb. of mixture | 16.24 |

$\frac{\$16.24}{812} \times 2{,}000 = \$40$, the cost per ton.

## To Cut Cash Outlay for Protein Feeds

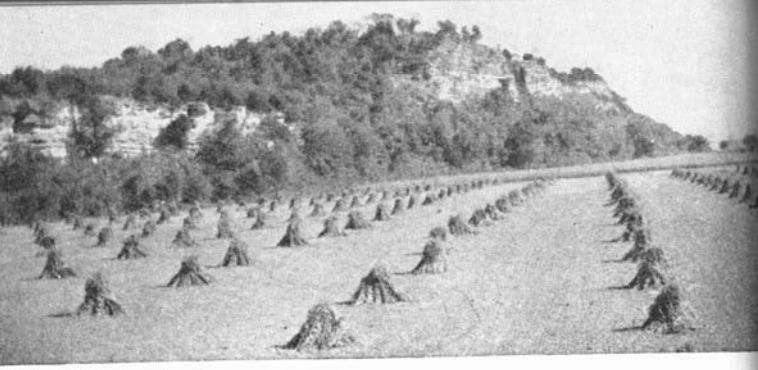
The need to buy high-protein feeds can be greatly reduced by adopting suitable cropping systems and by following a good feeding program. In making adjustments these are the things to know:

**Legume hays and pastures furnish much more protein than do nonlegume hay and pasture crops.** As shown in the formulas for grain mixtures on pages 10 to 13, the amount of high-protein feed needed in 13-percent protein mixtures is 75 to 100 pounds in 1,000 pounds of mixture, or 150 to 200 pounds in a ton of mixture. In 15-percent protein mixtures, about 350 pounds of high-protein feed is required in each ton. In 17-percent mixtures the amount is 500 pounds per ton. Thus by using an all-legume roughage in place of an all-nonlegume roughage, it is possible to avoid buying 350 pounds of high-protein feed for each ton of mixture fed. When there is a wide spread between the cost of the protein and the price of farm grains, this may be a worthwhile thing to do.

**Leaves of legumes are about twice as high in protein as are the stems.** High-quality hay which contains a high proportion of the leaves of the plant is therefore much higher in protein value than stemmy hay.

**Proper fertilizing of pastures and meadows raises their feed value.** It does this by increasing their yield, by increasing the proportion of legumes and lowering the proportion of weeds, and by raising the protein content of the forage.

**A larger amount of a lower-protein mixture can be used instead of a smaller amount of a higher-protein mixture.** The lower-protein mixtures use a larger proportion of farm grains. Therefore when commercial protein supplements are in short supply or high in price, and farm grains are plentiful and economically priced, it is a good practice to use the lower-protein mixtures but feed more of them. Thus 10 pounds of a 12-percent protein mixture will furnish exactly



Not the way to get the most feeding value per acre. Better forage could have been obtained by converting this corn to silage rather than leaving it in the shock.

the same amount of total protein as 8 pounds of a 15-percent mixture.

**Four pounds of good-quality legume hay contains as much digestible protein as 1 pound of high-protein feed.** If the cows are not consuming hay up to the limit of their capacity, and can be induced to eat 4 more pounds of good legume hay, this extra hay will give them as much protein as 1 pound of a high-protein feed such as soybean meal, for example.

## SPECIAL CARE AT CALVING TIME

Before freshening, dairy cows should be dried up and rested for 6 to 8 weeks — long enough to get them in good condition for the next milking period.

**Dry cows off gradually.** If a cow is giving as much as 10 or 12 pounds of milk daily, the drying-off process must be gradual in order to prevent injury to the udder. Begin by leaving part of the milk in each quarter at each milking and by reducing the amount of feed or the amount of protein in the feed. After a few days, omit one of the milkings entirely. When the cow is giving no more than 3 or 4 pounds daily, she need no longer be milked.

**Feed liberally while dry.** To put dry cows in good condition for the next lactation period, feed a grain mixture of 200 pounds ground corn and 100 pounds ground oats at the rate of 2 to 6 pounds daily, depending on the size and condition of the cows. Feed the grain in addition to good pasture or liberal amounts of legume hay.

**Use laxative feeds just before calving.** A week or 10 days before calving make the change to a ration having a laxative effect. Good pasture or liberal amounts of corn silage or legume hay will usually answer the purpose. But if only dry feed is given and legume hay is not available, feed one of the following mixtures at the rate of 2 to 4 pounds daily:

| (1) | (2) | (3) |
|---|---|---|
| Ground oats..100 lb. | Ground oats..200 lb. | Ground oats..100 lb. |
| Wheat bran..100 lb. | Linseed meal..100 lb. | Wheat bran...100 lb. |
| | | Linseed meal..100 lb. |

**Warm feed and water just after calving.** During the first 24 hours after calving see that both the feed and the drinking water are lukewarm, and give very little feed. For the next several days the drinking water should not be colder than water as it comes from a deep well.

To prepare a warm bran mash (a very suitable feed for the first day) put 3 or 4 quarts of wheat bran in a pail and pour enough boiling water over it to moisten it thoroughly; then pour in enough cold water to bring mash down to body temperature, and feed while warm.

Legume hays and corn silage or roots are especially desirable during the first few days.

## FEEDING YOUNG STOCK

### Dairy Calves

The first six months is the most important period of growth. A calf that is vigorous and well grown at six months is more likely to develop into a larger, better, more useful

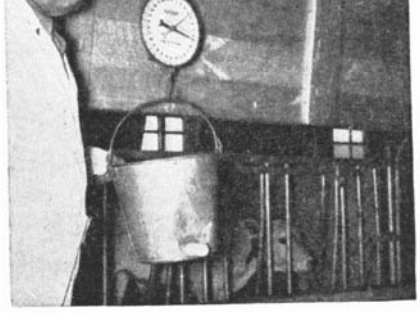
animal than one that is weak or stunted at that age. It pays therefore, to give close attention to rearing the calves durin this period, emphasizing the following points:

**Leave calves with their mothers for one to four days**— then separate them and feed the calves from a pail.

**Feed warm whole milk (body temperature) for at lea three weeks.** During the first week, use only a moderat amount of milk and divide it into three feedings daily. T *Jerseys*, feed 4 to 5 pounds (pints) daily; to *Guernseys*, 5 6 pounds; to *Ayrshires*, 6 to 7 pounds; to *Holsteins* and *Swis* 7 to 8 pounds. If calves are below average, or if they scou reduce the quantity.

Gradually increase the amount of milk until at 10 to days of age a calf is getting 1 pound of milk daily to ea 10 pounds of body weight. For example, a calf weighing 1 pounds should have 11 pounds of milk daily; that is, t feedings of 5½ pounds each.

**Beginning at two to three weeks of age** — give calves the good-quality legume hay they will eat, and not mo than 2 pounds of grain per head daily until they are months old. (*See discussion of legume hays, page 32.*)



**Weighing each calf's** at each feeding helps in the proper intake. Be growth and fewer diges troubles are the usual wards for this practice.

**If skimmilk is available** — it may be gradually substituted, pound for pound, for whole milk, starting about the third week and taking one week to make the change. Skimmilk may be either fresh or prepared (1 pound of dried skimmilk to 9 pounds of warm water).

Continue feeding skimmilk until the calves are 6 to 8 months old.

**If skimmilk is not available** — a calf starter made up according to the following formula can be used as soon as the calf will eat it, and gradually substituted for the whole milk. When this plan is followed, continue feeding whole milk at the recommended rate until the calf is 30 days old, then reduce the amount until at 6 to 8 weeks of age none is being fed.

### Calf Starter Formula

| | *lb.* | | *lb.* |
|---|---|---|---|
| Corn, ground yellow | 25 | Dried skimmilk | 20 |
| Oats, ground or crushed | 27 | Salt | 1 |
| Alfalfa leaf meal | 10 | Bonemeal (feeding grade) | ½ |
| Linseed meal | 11 | Limestone, ground | ½ |
| Soybean meal | 5 | Total | 100 |

If the calves are kept continuously in the barn and are not eating freely of sun-cured hay, it is advisable to add 3 ounces of commercial A-D dry concentrate to the above formula. (*For discussion of vitamins see pages 27-28.*)

**Other points to watch.** There are other general points in calf feeding and care that every dairyman should observe. For example:

Keep calves warm and dry and out of cold drafts at all times.

Supply an abundance of dry bedding. As soon after birth as possible, paint the exposed part of the navel cord with tincture of iodin or dip it in a strong solution of coal-tar disinfectant.

Wash feed pails thoroughly and scald with boiling water frequently.

Have milk in uniform condition from feeding to feeding.

Weigh or carefully measure the milk for each calf.

Do not overfeed.

Give milk in small amounts often.

If indigestion occurs, reduce the amount of milk to half or le and feed scalded milk or raw eggs. Study the needs of each cal

To keep calves from sucking each other, stanchion or tie the at milk-feeding time and give them some grain or hay at one after giving them the milk.

### Heifers

Many farmers neglect dairy heifers after they stop fee ing them milk. Heifers should be encouraged to eat all th good-quality roughage possible, in order to develop feedin capacity. They need grain in addition, however, the same cows do that are giving milk. The rate should be ⅓ to pound of grain mixture daily for each 100 pounds weig of the animal.

### Young Bulls

Adequate care for a young bull is even more importa than for a heifer, because the bull is expected to grow larger size and to exert a greater influence on the herd a whole.

Young bulls may be fed in much the same way as heif except that they need slightly more grain than heifers.

## COMMON QUESTIONS IN DAIRY CATTLE FEEDIN

### What Minerals Are Needed?

**Salt.** All dairy cattle except very young calves sho have free access to salt. When this is not possible, salt m be included in the grain mixture at the rate of 1.5 to 2 pou in 100 pounds of the mixture.

**Lime.** The best sources of lime for dairy cattle are go quality legume pasture, legume silage or legume hay, skimmilk. When legume roughages cannot be supplied, li can be furnished in ground limestone or in bonemeal

feeding grade. These can be included in the grain mixture at the rate of 1 to 2 pounds for each 100 pounds of mixture; or, for cattle fed in drylot or at pasture, a mixture of 2 parts limestone, 2 parts bonemeal, and 1 part salt may be supplied in boxes to which the cattle have free access.

**Phosphorus.** When grain mixtures are properly balanced with protein supplements such as wheat bran, cottonseed meal, and soybean meal, phosphorus deficiencies are not likely to develop. But when a ration is largely roughage and contains only a small amount of high-protein supplements, or when feeds are used that were grown on soils low in phosphorus, some additional phosphorus may need to be supplied. Bonemeal is a good source for the extra phosphorus. Rock phosphate should not be used unless it has been defluorinated, that is, most of the harmful fluorine has been removed.

**Other minerals.** In Illinois the other mineral elements needed in the rations of dairy cattle are rarely deficient when the rations are made up according to the recommendations given in this circular. If the feeds used are being grown on poor land, or an actual deficiency is suspected, the use of a trace-mineralized salt in place of ordinary salt is recommended. This special product contains a number of minerals besides ordinary salt.

## How Are Vitamins Supplied?

Dairy cows are not likely to suffer from a shortage of vitamins when they are well supplied with good pastures throughout the growing season and with good-quality sun-cured roughages throughout the barn-feeding part of the year. Next to green, growing crops the best sources of vitamins for dairy cows, are legume hays that have been so carefully cured in the sun that they have kept most of their leaves and much of their original green color and fragrance.

Calves fed only skimmilk, grain mixture, and hay low in green color are likely to need extra amounts of vitamin A.

Also, calves may need a vitamin-D supplement during th winter months, and during the rest of the year also unles they are out in the sunshine for an hour or more each day Calves that consume 2½ pounds or more of good-qualit sun-cured hay per head daily, get plenty of vitamin D.

For young calves that are not getting enough of vitamin A and D, a feeding grade of shark-liver oil or other liver o given at the rate of 1 teaspoonful daily for each 100 pound a calf weighs, or one vitamin capsule containing 5,000 unit of vitamin A and 500 units of D, given daily, will suppl ample amounts of both vitamins.

For older calves, an A-D concentrate included in th calf starter is satisfactory, as explained on page 25.

### Is a Variety of Proteins Necessary?

A ration is usually satisfactorily supplied with protein when it includes feeds from *four different kinds of plants*, pro vided each plant makes up a reasonable portion of the ratio and one is a legume roughage. This is a good general guid

Carefully conducted investigations have shown that th proteins of simple mixtures such as those shown on pages 1 to 13, when fed with good-quality roughages of the kind indicated, give just as good results as mixtures containin a much greater variety of feeds.

### Does Grinding Grain Increase Feed Value?

The grinding of farm grains to be fed to dairy cow usually increases their feeding value by 15 to 20 percen For high-producing cows and very small calves the grai should be ground. For low-producing cows, older calves, an heifers, the cost of grinding the grain should be compare with the increased value brought about by grinding.

Protein supplements also should be purchased groun rather than in nut or pea sizes, since the ground suppl ments mix better with ground grains.

## Is Grinding Roughage Worth While?

There appears to be no advantage in grinding good-quality hay for dairy cattle, because the digestibility of the hay is not increased thereby. Grinding or chopping coarse roughages such as soybean hay and corn stover does reduce the amount of feed refused, but the coarsest portions of such feed are already so low in nutritive value that the real saving may come to only 5 to 8 percent of the feeding value.

Another disadvantage to grinding roughage is that the dust from the ground roughage is objectionable — it is likely to get into the milk and it may irritate the throats of the workmen. The dust is especially objectionable in barns where high-grade milk is being produced.

## Should Grain and Roughage Be Ground Together?

Feeding dairy cows a mixture of grain and roughage ground together is not a good practice. It makes it impossible to feed the grain in proportion to milk yields and at the same time give the cows the amounts of roughage they need.

## Does Feed Cause Abortion?

When rations are very deficient in calcium, abortion sometimes occurs; but such cases are rare. Abortion is usually caused by disease germs, and there is no proof that the feeding of mineral mixtures will prevent or cure this type of abortion.

*See Illinois Circular 544, Brucellosis of Cattle.*

## Is Fat Test Affected by Feed?

Improved feeding of dairy cows does not, as a rule, raise the percentage of fat in the milk. Better feeding does increase the pounds of milk and consequently the *pounds of fat*, but does not increase the test (the *percentage* of fat in the milk).

A cow's test ordinarily varies somewhat during the lacta-

tion period. Cows that are fat when they freshen give mil that tests considerably higher than usual for a few weeks after that the test tends to remain about constant for severa months, though it may fluctuate slightly from day to da or from week to week because of weather changes or fo other reasons. Toward the end of the lactation there is gradual increase in the test, and during the last two or thre weeks a sharp rise usually occurs. The test usually is slightl higher during cold weather than during hot weather.

When the market requires that the milk of a dairy her receiving good feed and care be higher than it is, the way t improve the test is by selection and breeding rather than b changes in feeding practices. *The culling of low-testing cow and the selection of daughters of higher-testing cows for her replacement is the way to improve the herd test.*

### Is Silage Essential for Profitable Production?

Though silage is a desirable and economical feed, hig milk yields can be obtained without it, and also witho roots, provided high-quality legume hay is fed liberally.

### How Feed for High-Quality Milk?

In order to produce milk of the highest quality, cows mu receive liberal amounts of good-quality feeds. Best resul are obtained when cows are kept in good condition throug out the year.

**Minerals.** Though it is not possible to change appreciabl the amounts of most of the minerals in milk by changin the amounts of minerals in the feed, it is essential that t minerals be adequately supplied in the feed in order to mai tain a high level of production. Most of the minerals in t ration are furnished by the roughages — pasture, hay, an silage. Legume forages are the best source of calcium. Mo of the roughages, however, are not good sources of pho phorus, which is best supplied in high-protein supplement

As a rule, roughages grown on fertile soils are much higher in mineral content than roughages grown on poorer soils.

**Vitamins.** The vitamins naturally present in milk are also obtained mostly from the roughages. High vitamin content of milk is maintained by feeding cows on fresh green pastures that continue their growth throughout a large part of the year; or by feeding silage (including grass and legume silage) having a good green color, and excellent quality legume hays that have been quickly cured.

**Flavor.** Flavor in milk is definitely affected by the feeds the cows eat. Rations containing ample amounts of protein, minerals, and vitamins, and which have as their basis large amounts of green pasture crops or well-cured roughages high in green color, usually result in good-flavored milk.

Some feeds, however, and many weeds, have a detrimental effect on flavor. Wild onions, wild garlic, and ragweeds have such pronounced effects that the milk may be unsalable. Green rye, corn or legume silage, potatoes, buckwheat, rape pasture, cabbage, and sweet clover also tend to give undesirable flavor to milk, particularly if the cows have access to them within 6 to 8 hours before milking. If any of these feeds are used, they should be given to the cows *just after milking* rather than just before.

### What Plants and Trees Are Harmful?

Acorns, hedge apples, or hedge balls, persimmons, and the seeds of nearly all sweet sorghums contain substances (tannic acid or compounds similar to tannic acid) that have a strong astringent effect on the digestive system. They cause milk yields to fall off rapidly and cows to go dry before their time.

Certain weeds, such as white snakeroot, nightshade, cocklebur, water hemlock, jimson weed, dwarf larkspur, and a number of others, are poisonous to cattle. Poisonous trees include the wild cherry, black locust, and buckeye.

## FEEDING VALUE OF INDIVIDUAL FEEDS

**Alfalfa hay.** Probably the best dry roughage for dair cows. Superior to most other hays in palatability, protei lime, and vitamins. If of high quality, it can be used sati factorily as the only roughage for winter feeding.

**Red-clover hay.** Excellent for dairy cattle if of goo quality. Superior to alfalfa for young calves. For best qualit it should be cut when the crop has reached the half-bloo to full-bloom stage.

**Soybean hay.** Ranks close to alfalfa in protein and lim Cows like the finer portions but refuse the coarse stem which are very low in feeding value and comprise 10 to 2 percent of the hay. When the beans are fairly well mature the hay tends to dull the appetite if fed in large quantitie With such hay as the main roughage, soybean seed shou not be used in the grain mixture. Best results are obtain when red-clover or alfalfa hay is fed liberally once a d and the soybean hay is fed at other times.

**Cowpea hay.** When containing seed, ranks high as a dai feed. Rich in protein and lime, and very palatable. Quali often poor, however, because of difficulty in curing.

**Korean lespedeza.** Harvested at the early-bloom stag yields a very leafy, fine-stemmed hay which compares favo ably with alfalfa of equal grade. Has higher proportion leaves than alfalfa, but is lower in protein, fiber, and lim Dairy cattle relish it after they become accustomed to it.

**Timothy.** Not a good feed for dairy cows if harvested a mature stage. Low in protein and lime. Constipating. Gra mixtures needed with it are much more expensive than tho needed with legume hays. Timothy harvested *considera before blooming* is higher in protein and not so constipati though low in lime.

**Corn silage.** One of the best roughages for milk prod tion. Very low in protein and lime, and therefore best

with legume hay. More nutrients per pound of dry matter than good-quality hay. Has much the same place in winter feeding that fresh grass has in summer feeding. When moldy sometimes causes serious illness.

**Grass and legume silages.** Usually 10 to 20 percent lower in digestible nutrients than corn silage, but higher in protein. When one of these silages is used, it should be fed more liberally than corn silage, or other feeds should be fed more liberally with it. Percentage of protein in grain mixture can be lowered 1 to 2 points when grass or legume silage is fed liberally. (*See Circular 605, Grass and Legume Silages for Dairy Cattle.*)

**Sorghum silage.** Similar to corn silage in protein content but furnishes only 75 to 80 percent as much digestible nutrients per ton.

**Corn stover.** Relatively poor roughage for dairy cows, even compared with timothy hay. Low in protein and total digestible matter. Loses rapidly in feeding value if left in shocks in the field because rains leach away nutrients.

**Ground soybean seed.** A good protein supplement in grain mixtures, practically equal pound for pound to linseed meal provided the roughage does not consist largely of soybean hay. Has a laxative effect desirable in grain mixtures fed with nonlegume hay. A large proportion of ground soybeans (not soybean meal) in the grain mixture may give a gummy consistency to the butter produced, though the flavor is not adversely affected.

**Protein feeds.** Cottonseed meal, corn gluten feed and meal, linseed meal, soybean meal, soybean seed, and wheat bran are excellent feeds and are usually economical sources of protein. As a rule, the use of one or more of these feeds in grain mixtures for dairy cattle is profitable.

**Urea.** A feeding form of urea known as "262" (so named because it has a protein equivalent of 262 percent) furnishes six times as much protein per pound as the meals. It may

## Feed Value Yielded per Acre by Various Illinois Crops

(Based on estimated yields and average analyses)

| Crop | Yield of crop per acre | Digestible protein | Total digestible nutrients |
|---|---|---|---|
| **Barley** | *bu.* (*ton*) | *lb.* | *lb.* |
| Grain | 50 | 240 | 1 824 |
| Straw[a] | (1.5) | ... | ..... |
| Total | .... | 240 | 1 824 |
| **Corn** | | | |
| Grain, grade No. 3 | 50 | 196 | 2 156 |
| Stover[b] | (2) | 27 | 680 |
| Total | .... | 223 | 2 836 |
| **Corn silage**[c] | (10) | 190 | 3 230 |
| **Sorghum (sweet) silage**[c] | (10) | 190 | 3 040 |
| **Oats** | | | |
| Grain | 50 | 144 | 1 184 |
| Straw[a] | (1.5) | ... | ..... |
| Total | .... | 144 | 1 184 |
| **Soybeans** | | | |
| Seed | 25 | 525 | 1 395 |
| Straw[a] | (1) | ... | ..... |
| Total | .... | 525 | 1 395 |
| **Hay** | | | |
| Alfalfa | (3) | 720 | 3 240 |
| Cowpea | (1.5) | 360 | 1 440 |
| Lespedeza | (1) | 180 | 1 040 |
| Red clover | (1.5) | 300 | 1 500 |
| Redtop | (1.5) | 150 | 1 620 |
| Soybean | (2) | 370 | 1 800 |
| Timothy | (1.5) | 90 | 1 590 |

[a] Seldom fed to cows in milk, because of low content of digestible matter. Quantiti of total digestible nutrients are therefore not of interest and are not given here.

[b] Harvesting losses and refused portions of feed taken into account. Figures giv are therefore only about one-third of the feeding value of stalks, blades, and hus if all were saved and eaten.

[c] Spoilage taken into account.

replace part of the protein feeds but should make up not more than 3 percent of the grain mixture.

**Farm grains.** The cereal grains (corn and oats especially, but also barley and wheat) are excellent feeds for milk production, and when fed on the farm where grown, usually form the most economical basis for a good grain mixture.

Farm grains are low in protein, however, and in most cases must be combined with other feeds higher in protein. Usually it is economical to grind these grains for dairy feeds since digestibility is increased 15 to 20 percent thereby.

Nutrients in 100 Pounds of Various Dairy Feeds

| Feed | Total dry matter | Total protein | Digestible protein | Total digestible nutrients |
|---|---|---|---|---|
| **Concentrates** | *lb.* | *lb.* | *lb.* | *lb.* |
| Barley, grain | 90 | 13 | 10 | 76 |
| Beet pulp, dried | 91 | 9 | 4 | 72 |
| Brewers' dried grains | 92 | 25 | 21 | 72 |
| Corn, shelled | 87 | 9 | 7 | 77 |
| Corn-and-cob meal | 89 | 8 | 6 | 71 |
| Corn gluten feed | 90 | 28 | 23 | 78 |
| Corn gluten meal | 92 | 43 | 38 | 78 |
| Cottonseed meal, 38-43% protein | 93 | 41 | 34 | 68 |
| Cottonseed meal, over 43% protein | 93 | 44 | 36 | 69 |
| Distillers' dried grains | 93 | 28 | 20 | 82 |
| Hominy feed | 90 | 11 | 8 | 88 |
| Linseed meal, 33-38% protein | 91 | 35 | 31 | 74 |
| Linseed meal, 38-43% protein | 91 | 40 | 35 | 75 |
| Molasses, cane, or blackstrap | 76 | 3 | 1 | 60 |
| Oats, grain | 92 | 12 | 9 | 74 |
| Peanut meal, 43-48% protein | 93 | 45 | 40 | 79 |
| Rye, grain | 90 | 11 | 9 | 80 |

*(Continued on next page)*

| Feed | Total dry matter | Total protein | Digestible protein | Total digestible nutrients |
|---|---|---|---|---|
| **Concentrates** (cont'd) | *lb.* | *lb.* | *lb.* | *lb.* |
| Soybeans, seed | 92 | 39 | 35 | 93 |
| Soybean meal, 38-43% protein | 92 | 42 | 38 | 77 |
| Soybean meal, 43-48% protein | 92 | 45 | 40 | 76 |
| Wheat, grain | 89 | 12 | 9 | 74 |
| Wheat bran | 91 | 16 | 13 | 61 |
| Wheat standard middlings | 90 | 17 | 13 | 63 |
| **Dried Forages** | | | | |
| Alfalfa hay | 93 | 15 | 12 | 54 |
| Alfalfa-leaf meal | 91 | 21 | 16 | 57 |
| Clover, alsike, hay | 89 | 14 | 10 | 53 |
| Clover, red, hay | 93 | 16 | 10 | 50 |
| Bromegrass hay | 86 | 9 | 5 | 48 |
| Corn fodder (with ears) | 88 | 7 | 3 | 54 |
| Corn stover | 89 | 6 | 2 | 51 |
| Cowpea hay | 90 | 18 | 12 | 48 |
| Lespedeza hay | 92 | 12 | 9 | 52 |
| Oat hay | 88 | 6 | 3 | 48 |
| Redtop hay | 91 | 8 | 5 | 54 |
| Soybean hay | 92 | 16 | 11 | 53 |
| Sudan-grass hay | 90 | 9 | 4 | 51 |
| Sweet-clover hay | 92 | 16 | 12 | 52 |
| Timothy hay | 93 | 8 | 3 | 53 |
| **Silage** | | | | |
| Alfalfa silage | 31 | 6 | 4 | 16 |
| Corn silage | 29 | 2 | 1 | 17 |
| Peavine silage | 25 | 3 | 2 | 14 |
| Red-clover silage | 28 | 4 | 2 | 12 |
| Sorgo silage | 25 | 2 | 1 | 16 |
| Soybean silage | 24 | 2 | 2 | 13 |
| **Milk** | | | | |
| Milk, skim | 9 | 3 | 3 | 8 |
| Milk, skim, dried | 95 | 36 | 31 | 81 |
| Milk, whole | 13 | 3.6 | 3.6 | 14 |

*Do you make these*

# COMMON MISTAKES *in* SUMMER *Feeding?*

Pasture cows before there is enough forage to make good feed?

Change too suddenly from barn feeding to pasture feeding?

Overlook importance of salt, supplying it only once a week?

Neglect to furnish additional roughage, such as silage or hay, when pastures are short?

Let your cows go hungry for grain during the pasture season?

*—These mistakes are paid for in lower milk yields . . .*

**IF YOU HAVE QUESTIONS** on dairy cattle feeding that are not answered in this handbook, please feel free to write —

DEPARTMENT OF DAIRY SCIENCE
UNIVERSITY OF ILLINOIS
URBANA

2-51—28M—45399